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DESCRIPTION OF SURFICIAL-GEOLOGIC MAP UNITS

(All map units may not appear on both sheets)

The accompanying map shows the distribution of unconsolidated deposits and undifferentiated bedrock exposed at the surface in the western segment of the corridor straddling the Alaska Highway through the Big Delta and Mt. Hayes quadrangles. Deposits were mapped by interpretation of false-color infrared 1:65,000-scale aerial photographs taken in July 1978, August 1980, and August 1981 and verified by field checking in 2006 and 2007.

UNCONSOLIDATED DEPOSITS[1]

ALLUVIAL DEPOSITS

Qa UNDIFFERENTIATED FLOODPLAIN ALLUVIUM—Chiefly well-sorted and well-stratified polymictic pebble gravel, sand, and silt comprising channel and overbank deposits of generally small streams; unfrozen to discontinuously frozen with low to moderate ice contents

Qaa ACTIVE-FLOODPLAIN ALLUVIUM—Chiefly well-sorted and well-stratified layers and lenses of polymictic pebble gravel, sand, and silt with rare to scattered cobbles comprising river bars subject to recurrent inundation by streams every 5 yr or less (Chapin and others, 2006); mapped extent is a function of river level (stage) and reflects the transitory extent of exposed river bars at the time the photographs were taken; in braided and anastomosing reaches, active channels typically shift positions from year to year and present channel locations may differ from locations on the August 1980 photography on which the deposits were mapped; active alluvium underlies upper stream bank and active stream channels and includes point-bar and meander-scroll deposits (Brakenridge, 1988); composed dominantly of gravel and sand where stream is braided and anastomosing (Emmett and others, 1978; Burrows and others, 1979; Burrows and Harrold, 1983) and sand and silt bars and cover deposits where meandering; prone to earthquake-induced liquefaction where fine grained and unfrozen; where braided, subject to formation of extensive, thick seasonal-stream icings (aufeis); generally unfrozen, except seasonally frozen to depth of frost penetration; shallow water table

Qai INACTIVE-FLOODPLAIN ALLUVIUM—Chiefly 2 to 20 ft (0.6 to 6 m) of overbank silty sand and sandy silt overlying gravelly, polymictic riverbed sand and sandy gravel beneath surfaces subject to flooding at least once or twice every century (Mason and Begét, 1991; Chapin and others, 2006); may include more than one terrace level; overbank sequences include flood-related features, like natural levees, crevasse splays near channels, and fine-grained back-levee swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); surface peat generally absent; generally unfrozen in younger areas and discontinuously frozen in older areas with low to moderate ice contents; active channels may be floored by 5 to 20 ft (1.5 to 6 m) of generally unfrozen sand and silty sand; fills of inactive channels may include 7 to 12 ft (2.1 to 3.7 m) of discontinuously frozen organic sand and silt with moderate to high ice contents over sand and gravelly sand

Qab ABANDONED-FLOODPLAIN ALLUVIUM—Chiefly 10 to 20 ft (3 to 6 m) of overbank sandy silt and silty sand overlying sandy, polymictic riverbed gravel beneath surfaces with widespread cover of lowland loess and local sand dunes and subject to stream flooding about once every 500 to 1,000 yr (Mann and others, 1995); may include several terrace levels; overbank sequences include flood-related features, like natural levees and crevasse splays near channels and fine-grained, peaty back-levee swale deposits farther from channels (Brakenridge, 1988; Mann and others, 1995); may contain organic-silt channel fills 7 to 20 ft (2.1 to 6 m) thick; surface peat generally discontinuous to widespread in backwater areas away from channels; generally frozen with low to moderate ice contents

Qaf ALLUVIAL-FAN DEPOSITS—Fan-shaped deposits of nonsorted to well-sorted gravel, sand, and silt with numerous cobbles and boulders in proximal zone; lithologies reflect bedrock of source area; in general, size of clasts decreases and degree of sorting increases downfan; typically mixed with debris-flow deposits in proximal part of fans; unfrozen to discontinuously frozen, except in fine-grained distal deposits where permafrost may be shallow and continuous; ice contents low to moderate

Qat STREAM-TERRACE ALLUVIUM—Chiefly 4 to >20 ft (1.2 to >6 m) of organic sandy silt and silty sand overlying well-sorted, polymictic sand and gravel beneath stream terrace treads no longer subject to inundations by the stream that deposited the alluvium (Kreig and Reger, 1982); may include several levels and incorporate outwash alluvium of

Donnelly age in highest terraces; locally covered by ≤15 ft (≤4.5 m) of lowland loess and eolian-sand blanket and dunes complexes, particularly close to active sediment sources; other surface features, like expansion fans and bars, crevasse splays, and pebbly sand waves and dunes, relate to deposition and erosion during jökulhlaups of probable Delta and Donnelly ages; includes granitic flood boulders enclosed in pebble–cobble gravels on strath terraces of Donnelly age; locally subject to seasonal stream icings where buildup of aufeis in stream channels diverts subsequent drainage and spreads aufeis and meltwater across terrace treads that would not otherwise be flooded (Springer and others, 1976; Sloan and others, 1976); continuously to discontinuously frozen with low to moderate ice contents

Qfb JÖKULHLAUP DEPOSITS—Large expansion fans, crevasse-splay complexes, pendant bars, and linear bars fanning away from the modern floodplain of Tanana River on terraces along the southern margin of the Yukon–Tanana Upland; typically located downstream from bedrock ridges that trend transverse to the Tanana River; include streamlined terrace remnants preserved downstream from bedrock ridges and knobs and a lengthy longitudinal bar on the concave, southern side of the valley in the Sam Creek area; partially fill some lakes along the northern margin of the Tanana Lowland; typically composed of clean, coarse to medium pebbly sand overlying cobble gravel with scattered large granitic 'flood' boulders; also include fine-grained backswamp deposits between expansion fans and crevasse splays and bedrock hills; beneath 26 ft (7.9 m) of proximal outwash alluvium of Donnelly age in the vicinity of Johnson River include >10 to 12 ft (>3 to 3.6 m) of clean, light brownish gray (10YR6/2), very fine to medium sands with thin pebble layers and trace silt with thin, rippled beds separated by thin silt drapes (Birch, 1976) that were probably laid down as a slackwater deposit near the margin of one or more outburst floods of early Donnelly age down the nearby Tanana River; unfrozen to discontinuously frozen; low ice contents

Qfs SLACKWATER FLOOD DEPOSITS—Chiefly organic sandy and silty backswamp sediments deposited during floods in slackwater basins separated from source streams by expansion fans and natural-levee and crevasse-splay complexes; typically inundated by shallow water between flood events; surface vegetation is water-tolerant shrubs and peat bogs; may be associated with open-system pingos, numerous thaw ponds and lakes, and thermokarst pits; inferred to be continuously frozen and ice rich

COLLUVIAL DEPOSITS

Qc UNDIFFERENTIATED COLLUVIUM—Blankets, aprons, cones, and fans of heterogeneously mixed angular to subangular rock fragments, gravel, sand, and silt formed by complex, gravity-driven mass movements involving sliding, flowing, gelifluction, and frost creep of weathered bedrock and modified glacial drift; cobbles and boulders are scattered to numerous; on lower headwalls of cirques and upper walls of glaciated valleys includes talus aprons, incipient rock glaciers, and related features, as well as steep fans built by snow avalanches and debris flows; may include thin residual deposits and lags of former Tertiary sedimentary rock and highly modified drift of ancient glaciations on high-level remnants of former pediments; morphologies of colluvial sheets generally reflect morphologies of underlying materials; discontinuously to continuously frozen with low to moderate ice contents

Qca SNOW-AVALANCHE DEPOSIT—Steep fans of heterogeneous rubbly debris with some gravel, sand, and silt deposited by snow avalanches in and downslope of couloirs in steep alpine terrain; surface covered with scattered, angular rock fragments; may be crudely sorted by grain size with the largest fragments farther downslope; typically associated with talus cones and aprons; discontinuously frozen with low to moderate ice contents

Qcd DEBRIS-FLOW DEPOSIT—Chiefly tongues of angular rock fragments and coarse gravel with a sandy matrix deposited on steep colluvial slopes and fans and in rock-walled upper stream valleys by flowing slurries of mud, sand, rock debris, and gravel generated during sudden intense summer rainstorms; initial fine fractions are later winnowed, leaving coarse gravel and rubble tongues and lobes, some with natural levees of cobbles and boulders up to 7 ft (2.1 m) high bounding medial channels with rectangular to U-shaped cross profiles measuring 10 to 70 ft (3 to 21.3 m) across and 10 to 60 ft (3 to 18.3 m) deep; many large boulders and blocks have small debris mounds and scattered cobbles on upper surfaces; generally unfrozen to discontinuously frozen with low ice contents

Qcf MIXED COLLUVIUM AND ALLUVIAL DEPOSITS—Primarily fan-shaped or elongate, massive to poorly stratified, generally inorganic silt mixed with sandy angular to subangular pebble gravels derived from weathered granitic uplands and laid down by debris flows and hyperconcentrated flows produced during brief, intense summer storms; also formed in loess-covered moraines; colluvial processes exceed fluvial processes; surface slightly irregular; contains numerous cobbles in glacial terrain and angular to subangular, fresh to weathered rock fragments and grüs in weathered granitic bedrock terrain; discontinuously to continuously frozen with low to moderate ice contents

Qcg ROCK-GLACIER DEPOSIT—Tongue-shaped heterogeneous surface blanket of angular to subangular blocks of local bedrock overlying deformed ice with trace to some gravel, sand, and silt at depth; where active, blocky surface layer is disrupted on steep marginal slopes and core debris is exposed; accumulated on floors and lower walls of cirques and glaciated valleys by flow of rock glaciers derived from shrinking of former glaciers (ice cored) or from deposition and cementation and deformation of precipitation-derived ground ice (ice cemented); surface typically has furrows, nested arcuate ridges arranged convexly downvalley, and pits and may have prominent lateral ridges; perennially frozen where active with moderate to high ice contents

Qcl LANDSLIDE DEPOSIT—Lunate to triangular or fan shaped, heterogeneous mixtures of large fractured bedrock blocks and pebble gravel with scattered to numerous cobbles and boulders and trace to some sand and silt deposited by near-surface to deep creeping, flowing, and sliding of failed bedrock and unconsolidated surficial deposits; surface features include gaping ground cracks where active, slight irregularities, hummocks, low longitudinal ridges, and terminal bulges; unfrozen to continuously frozen with low to moderate ice contents

Qcr ROCK-FALL DEPOSIT—Rubble blanket or apron of large, angular rock fragments of local bedrock formed by collapse of upslope outcrop; unfrozen to discontinuously frozen with low ice contents

Qct TALUS—Cone- and apron-shaped heterogeneous mixtures of frost-rived, angular rock fragments downslope of bedrock outcrops with trace to some gravel, sand, and silt deposited on steep bedrock slopes and at the mouths of steep bedrock couloirs with U-shaped cross profiles by snow avalanches, free fall, tumbling, rolling, and sliding; surface steep, slightly irregular, and covered with numerous rock fragments, particularly in distal zones; includes debris-flow tongues; blocks and boulders covered by crustose lichens where stable, and lichen free where freshly displaced; unfrozen to discontinuously frozen with low ice contents

EOLIAN DEPOSITS

Qel LOESS—Silt with up to 15 percent very fine sand carried by winds and deposited as a blanket over downwind topography (Péwé, 1951, 1955); mixed with eolian sand on lower slopes and on lowland surfaces close to floodplain sources; may include intimate mixtures with retransported silt; thickness ranges from >20 ft (>6 m) close to active sediment sources to ~2 ft (~0.6 m) elsewhere (Lindholm and others, 1959); typically rilled where >3 ft (>0.9 m) thick on steep upper slopes, but areas of mapped loess should be considered minimal because of dense tree canopy; organic rich on lower slopes and lowland sites; moderate to high moisture content (>15 percent) in lowland sites (Kreig and Reger, 1982); generally unfrozen, except discontinuously frozen with moderate to high ice contents on some lower south-facing slopes and continuously frozen and ice rich on some lower north-facing slopes and lowland sites

Qer RETRANSPORTED SILT AND SAND AND LOWLAND LOESS—Chiefly massive to well-stratified organic silt and sandy silt with lenses and tongues of locally derived gravel and scattered to numerous angular rock fragments (particularly in upper valleys of small ephemeral streams) in loess areas and organic fine sand in sand dune areas; deposited primarily by hyperconcentrated flows (Costa, 1988) draining weathered bedrock slopes thinly covered by upland silt (loess) and eolian sand and generated by thawing of ice-rich permafrost or brief, intense summer rainstorms; complexly mixed with debris-flow deposits in upper stream drainages, primary airfall loess and eolian fine sand in lowland sites, and fine-grained distal overbank sediments in slackwater flood basins; fluvial processes exceed colluvial processes; surface fairly smooth with scattered open-system pingos and local thermokarst pits, ponds, and lakes; may be subject to seasonal stream and slope icings; discontinuously to continuously frozen with moderate to high ice contents

Qes EOLIAN SAND—Chiefly vegetated blankets and dunes of fine to medium, massive to cross-bedded eolian sand with trace to some silt (Kreig and Reger, 1982, pl. 9); dunes stand 5 to 15 ft (1.5 to 4.5 m) in relief and ridges may extend for up to 3 mi (4.8 km) in the direction of past dominant summer winds; mapped extents, based on the presence of dune forms, should be considered minimum; cliffhead dunes locally crown steep slopes that are the sand sources; discontinuous with thicknesses up to ~25 ft (~7.6 m) (Schoephorster, 1973); unweathered color grayish brown (2.5Y5/2); generally covered by 1 to 3 ft (0.3 to 0.9 m) of loess (Lindholm and others, 1959); locally being deposited along the margins of braided floodplains; average moisture content ~8 percent (Kreig and Reger, 1982); discontinuously frozen with low ice contents

GLACIAL DEPOSITS

DONNELLY GLACIATION

Qgdy TILL AND ASSOCIATED MORAINAL DEPOSITS OF DONNELLY GLACIATION—Heterogeneous, nonstratified, polymictic pebble–cobble gravel with some sand and silt and few to numerous subangular to subrounded boulders deposited by glacial ice and locally reworked by meltwater washing and associated mass-movement processes; may include esker and kame deposits (Qgey); morainal relief 50–175 ft (15.2–53 m); kettle frequency ~16/mi^2 (50/km^2); kettle fillings of silt, peat, and silty colluvium generally thin but may be several feet (meters) thick close to active sources of eolian deposits; maximum till thickness ~300 ft (~91 m); surface weathering profiles 1.5–2.5 ft (0.5–0.8 m) thick; friable; sand matrix weathered to brown (10YR5/3); intact schist clasts in weathering profiles 25–35 percent and granitic clasts fresh to slightly weathered; discontinuous cover of loess generally ≤3 ft (≤0.9 m) thick and weathered yellowish brown (10YR5/8) to light yellowish brown (10YR6/4) but eolian sand and silt mantle may be >20 ft (>6 m) thick close to active sediment sources and may obscure primary surface morphology; ventifacts exhibit slight to moderate surface polish and shallow pitting but lack facets and keels in lags developed beneath loess covers; ice-wedge casts generally rare and up to 3 ft (0.9 m) wide; unfrozen to discontinuously frozen with low to moderate ice contents (Péwé and Holmes, 1964; Holmes, 1965; Carter and Galloway, 1978; Péwé and Reger, 1983a, table 3)

DELTA GLACIATION

Qgdo TILL AND ASSOCIATED MORAINAL DEPOSITS OF DELTA GLACIATION—Heterogeneous, nonstratified, polymictic pebble–cobble gravel with some sand and silt and few to numerous subangular to subrounded boulders deposited by glacial ice and massive, sandy pebble gravel with rare cobbles deposited by glacial meltwater and associated mass-movement processes; may include esker and kame complexes (Qgeo); morainal relief 25–225 ft (7.6–68.6 m); kettle frequency ~3/mi^2 (8.3 km^2); kettle fillings of silt, peat, and silty colluvium may be several feet (meters) thick; maximum till thickness ~200 ft (~60 m); surface weathering profiles generally 3–7 ft (0.9–2.1 m) deep, on high-level surfaces may locally be >10 ft (>3 m) deep; friable to strongly cemented with numerous clast molds; sand matrix weathered light yellowish brown (10YR6/4) to brownish yellow (10YR6/6); intact schist clasts in weathered profiles 1–10 percent and ≤50 percent of granitic clasts are crumbly; discontinuously mantled by thin eolian sand and loess; loess cover weathered to light reddish brown (5YR6/4) (rubification); well-formed faceted and keeled ventifacts common in surface lags beneath loess covers; ice-wedge casts scattered to numerous and up to ~5 ft (~1.5 m) wide; wedge fillings include deformed eolian sand that is locally pebbly; unfrozen to discontinuously frozen with low to moderate ice contents (Péwé and Holmes, 1964; Holmes, 1965; Carter and Galloway, 1978; Péwé and Reger, 1983a, table 3)

PRE-DELTA GLACIATION(S)

QTgdp UNDIFFERENTIATED GLACIAL DRIFT OF PRE-DELTA GLACIATION(S)—Thin, discontinuous to continuous sheets of heterogeneous pebble gravel, sand, and silt with rare to numerous cobbles, boulders, and blocks up to 8 ft (2.4 m) in diameter deposited directly from melting glacial ice and reworked by meltwater streams; includes drift of Darling Creek and perhaps other pre-Delta glaciations on alpine surfaces and lower mountain slopes south of Tanana River; sandy matrix weathered pale brown (10YR6/3) to brown (10YR5/3); surface morphology extensively modified by mass-movement processes; unfrozen to discontinuously frozen with low to moderate ice contents (Péwé and Reger, 1983a; Weber, 1986; Duk-Rodkin and others, 2004)

GLACIOFLUVIAL DEPOSITS

DONNELLY GLACIATION

Qgey ESKER–KAME COMPLEX OF DONNELLY GLACIATION—Complex mixtures of sand, pebble gravel with some sand and silt, and diamicton deposited in holes, tunnels, and narrow ice-walled valleys in stagnant glacial ice by sediment-charged meltwater streams and by debris flows generated by melting glacial ice; subangular to rounded cobbles and boulders range from rare to numerous; well to poorly sorted; thin to massive bedded; locally crossbedded; surface has high relief and is characterized by discontinuous, sinuous, anastomosing and bifurcating, steep-sided ridges (eskers) typically associated with small, steep-sided hills (kames); unfrozen

Qgfy OUTWASH OF DONNELLY GLACIATION—Massive to well-sorted, polymictic pebble gravel with some sand and scattered to numerous subrounded to subangular cobbles and boulders ≤7 ft (≤2.1 m) in diameter in proximal zones; surface weathering profiles ≤3 ft (≤0.9 m) deep; sand matrix color varies from pale brown (10YR6/3) to brown (10YR5/3); 5 to 10 percent of foliated tillstones are typically split into plates by frost action and granitic tillstones are fresh to slightly weathered in weathered profiles, except locally, where foliated tillstones are shattered to small, platy fragments and granitic clasts are reduced to crumbly remnants by the growth of calcite (caliche) in the upper 3–4 ft (0.9–1.2 m) of the outwash deposit; silt caps 0.08 to 0.12 in (2 to 3 mm) and discontinuous; cover sands discontinuous and up to ~10 ft (~3 m) thick; average loess cover ~0.4 ft (~12 cm) thick and generally weathered light yellowish brown (10YR6/4) to brown (10YR5/3), except red (2.5YR5/6) where strongly oxidized after repeated wildfires (Ping and others, 2006); ventifacts exhibit slight to moderate surface polish and pitting but no facets or keels in lags developed beneath loess covers; ice-wedge casts generally rare, but locally common and ≤3 ft (≤0.9 m) wide (Péwé and Reger, 1983a, p. 62–66); deformed wedge fillings composed of brown to greenish-gray silt with trace to some pebble gravel and scattered cobbles; unfrozen to discontinuously frozen with low ice contents

DELTA GLACIATION

Qgeo ESKER–KAME COMPLEX OF DELTA GLACIATION—Complex mixture of sand, pebble gravel with some sand and silt, and diamicton deposited in holes, tunnels, and narrow ice-walled valleys in stagnant glacial ice by sediment-charged meltwater streams and by debris flows generated by melting glacial ice; well modified with subdued relief compared to esker–kame complexes of Donnelly age but distinctive sinuous, bifurcated morphology clearly recognizable; unfrozen

Qgfo OUTWASH OF DELTA GLACIATION— Massive to well-sorted, polymictic pebble gravel with some sand and numerous subrounded to subangular cobbles and boulders ≤3.5 ft (≤1.1 m) in diameter; coarser in proximal zones and finer where distal; surface weathering profiles ≥12 ft (≥3.6 m) deep; sand matrix color varies from pale brown (10YR6/3) to very pale brown (10YR7/4); ~50 percent of foliated and granitic clasts in weathered profile are rotten; silt caps on clasts in weathered profile ≤0.08 in (≤2 mm) thick; cover sands discontinuous and up to ~10 ft (~3 m) thick;

loess cover typically 1 to 2 ft (0.3 to 0.6 m) thick; well-formed faceted and keeled ventifacts common in surface lags beneath loess covers; quartz pebbles in lags stained yellowish brown (10YR5/4) to very pale brown (10YR7/4); ice-wedge casts scattered to numerous and ≤3.5 ft (≤1.1 m) wide; deformed wedge fillings are typically eolian sand with trace to some silt and pebble gravel and may include scattered pebble ventifacts; unfrozen to discontinuously frozen with low ice contents

LACUSTRINE DEPOSITS

Qlb LAKE-BOTTOM DEPOSITS—Chiefly silt and clay with some sand and organic material deposited in ephemeral lakes in backwater areas of inactive floodplains and behind ice-shoved ramparts in large lakes; discontinuously to continuously frozen with moderate to high ice contents

Qld DELTA DEPOSITS—Chiefly sand and silt with some organic material deposited in a lake basin by a stream entering the lake; during floods of the Tanana River, streams normally draining the lake into the river reverse directions and carry floodwaters and sediments into the lake basin; discontinuously frozen with moderate to high ice contents

Qlr DEPOSITS OF ICE-SHOVED RIDGES—Single or multiple 3- to 5-ft-high (0.9- to 1.5-m-high) ridges parallel to and 2 to 15 ft (0.6 to 4.5 m) above modern lake shorelines; composed of overturned and severely and complexly deformed deposits of adjacent lake bottoms, including fine to coarse clastic lake-bottom sediments and peat with thin interlayered light gray tephras; built by shoreward transport of lake-bottom sediments by wind-driven, drifting lake ice (Péwé and Reger, 1983b, figs. 22A and B); unfrozen to discontinuously frozen with low to moderate ice contents

PALUDAL DEPOSITS

Qp SWAMP DEPOSIT—Primarily fibrous and locally woody, autochthonous peat with organic silt and sand deposited in lowland sites (Kreig and Reger, 1982); ≤8 ft (≤2.4 m) thick; discontinuously to continuously frozen with moderate to high ice contents

RESIDUAL DEPOSITS

QTr BLOCK RUBBLE—Nests and blankets of angular to subangular blocks derived by frost wedging and jacking of underlying bedrock (autochthonous block fields) on high-level surfaces and bedrock slopes, or as lags left by winnowing of sandy matrix from gelifluction deposits or thin till by subterranean piping (allochthonous block fields); locally may be included in units of thinly covered bedrock (b') and in shallow strath terraces; sizes of blocks are function of joint spacing in local bedrock; associated microrelief features formed by frost action and mass movement include stone polygons, stone nets and circles, stone stripes, nonsorted circles and hummocks, and soil lobes and benches; frost jacking locally active; discontinuously frozen with low to moderate ice contents

[1] Estimated contents of sand and silt, based on field observations, are indicated by the terms ‘trace’ and ‘some.’ ‘Trace’ implies a general composition of 4 to 12 percent. ‘Some’ implies a general composition of 12 to 30 percent. Estimated compositions <4 percent are not recorded in the field. Terms used to describe the estimated percentages of cobbles and boulders are ‘numerous,’ ‘scattered,’ and ‘rare’. ‘Numerous’ implies that drilling through the deposit would encounter two cobbles or boulders in an interval of 2 ft (0.6 m); ‘scattered’ implies that drilling would encounter two cobbles or boulders in an interval of 10 to 15 ft (3 to 4.5 m); ‘rare’ implies that drilling would encounter two cobbles or boulders in an interval of >15 ft (>4.5 m). These numbers are field estimates only, based on surface observations, and may vary widely.

BEDROCK

b UNDIFFERENTIATED BEDROCK—Outcrops of igneous, metamorphic, and sedimentary rocks; linear and curvilinear shallow troughs and linear changes of surface vegetation indicate the presence of planar bedrock structures

b' THINLY COVERED BEDROCK—Subcrops with <3 ft (<0.9 m) of loess cover; bedrock structures visible through thin veneer of surficial debris

b + b' Bedrock outcrops and thinly buried subcrops that cannot be mapped separately